PV Value™

Sandia National Laboratories

Roger Hill rrhill@sandia.gov (505)844-6111

SOFT COSTS

Overview

Importance to the Resale Market of Homes with PV

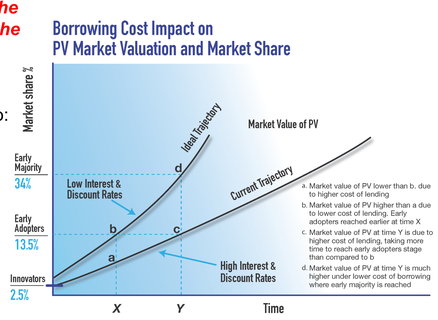
- Value of PV system may or may not be included in the sale price of a property
- Comparable properties – Limited or none
- Cost and incentives change and are sometimes unknown to appraiser
- Knowledge base of appraiser
- If home or business owner is not compensated for investment, depressed demand may result
- Realistic value = 'bankability'

Appraisal Methodology

- PV Value uses the **Income Capitalization Approach**

The present value of the PV system is equal to the capitalized value of the net income stream that the PV system can generate

- One of three appraisal approaches, cost and comparable sales are the other two
- For PV, the value of the income stream is related to:
  1. energy production
  2. existing electricity rate
  3. utility escalation rate
  4. discount rate
  5. O&M expenses over its remaining useful lifetime
- Reviewed for financial accuracy by licensed appraisers



Limitations of PV Value Approach

- Needs internet access to work
- Currently works in Excel 2007 and 2010 for Windows
- Only valid for grid-tied PV systems with net metering
- Applies to residential and commercial properties
- Tax liability is not addressed
- Commercial depreciation is not addressed
- Does not address aesthetic and 'green cache' value
- Does not include SREC's, REC's, net differentials, FIT's, above and beyond net metering
- Only for leased systems when determining fair market value for lease-to-purchase
- *More detail in Klise and Johnson (2012a)*

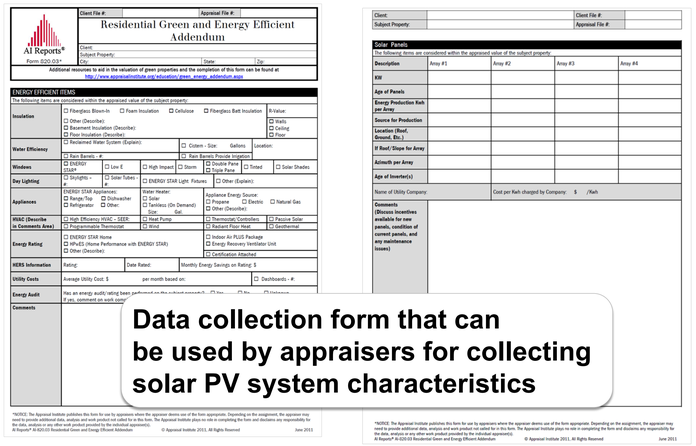
Data Analysis & Education

What does the Appraiser need to know about the PV system specifications?

- Can you figure out the size of this array from looking at it?
- What is the month and year of installation?
- Is there a custom derate factor for this system that takes into account the shading?
- Do you know how long the module warranty period is for?
- How about the azimuth direction the modules are facing and the slope of the modules?

- Appraisers and other real estate professionals need training to understand PV systems so an accurate determination of value can be made
- Working to develop residential and commercial PV system appraisal class to be taught by the Appraisal Institute in early 2013

Data Analysis & Education Cont'd.



PV Value Benefits to System Installers

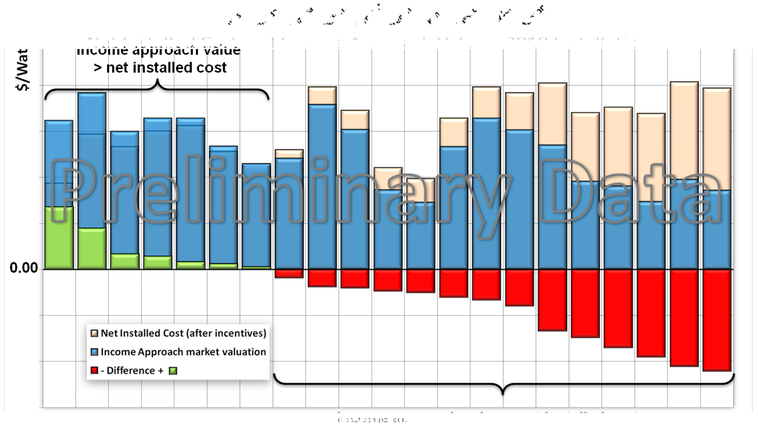
- Additional financial metric beyond simple payback
- Allows for comparison between purchasing or leasing
- New service 'opportunity' if more detailed analysis is needed by appraiser
  1. Compare measured and modeled system performance
     - Determine current derate factor
  2. Shading after 10 years, impacts to performance
  3. PV system not working properly

Results

Residential Market

Net Installed Cost and Income Approach Value – 2010 Installs

Results from Klise et al., in preparation, to be published in the Appraisal Journal



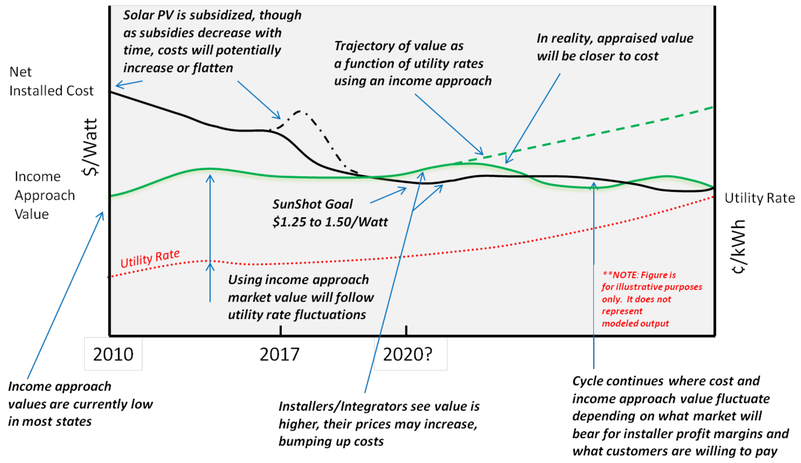
States shown are those used in Barbose et al. (2011) "Tracking the Sun IV" for installed cost comparison

Future Direction

Ongoing and Future Work

- Use actual sales transactions from Hoen et al. (2011) to validate PV Value and better refine increase in property value analysis
- Education and valuation research. Partnering with Lawrence Berkeley Natl. Lab, Solar Power Electric, Appraisal Institute, national mortgage lenders
- Incorporate depreciation, installed cost, taxes and other features for commercial analysis
- Allow option to allow utility escalation rate to follow remaining lifetime
- Utilize current year REC income, or long-term if fixed
- Feed-In-Tariff analysis option
- Major updates expected September 1, 2012
- Creating Mac Excel 2011 version

Implied Relationship between Installed Cost Value & Income Approach Value



Relevant Publications

- Barbose, G., N. Darghouth, R. Wiser and J. Seel, (2011) *Tracking the Sun IV - An Historical Summary of the Installed Cost of Photovoltaics in the United States from 1998 to 2010*, LBNL-5047E, Lawrence Berkeley National Laboratory, Berkeley, CA
- Klise, G., and Johnson, J., (2012a) *PV Value™ - User Manual v. 1.0*, SAND2012-0682P, Sandia National Laboratories, Albuquerque, NM, 22 pages
- Klise, G. and J. Johnson, (2012b) "Photovoltaic System Valuation Model – PV Value," Webinar presentation to Interstate Renewable Energy Council (IREC) Solar Instructor Training Network, SAND2012-3149P, April 18, 2012. Available at: http://www.sitnusa.org/trainer-resources/seminars and https://vimeo.com/40703731
- Klise, G.T., J. Johnson, S. Adomatis, and B. Hoen, *A snapshot of the potential added value of solar photovoltaic systems in the U.S.*, working paper for the Appraisal Journal, In preparation
- Hoen, B., R. Wiser, P. Cappers, and M. Thayer (2011) *An Analysis of the Effects of Residential Photovoltaic Energy Systems on Home Sales Prices in California*, LBNL-4476E, Lawrence Berkeley National Laboratory, Berkeley, CA

PV Value can be downloaded at:

http://pv.sandia.gov/pvvalue

SunShot U.S. Department of Energy

U.S. DEPARTMENT OF ENERGY

Sandia National Laboratories is a multi-program laboratory managed and operated by Sandia Corporation, a wholly owned subsidiary of Lockheed Martin Corporation, for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000. SAND2012-8904P